Risk assessment of alimentary transmission of tick-borne encephalitis viruses from goats to humans by means of milk and milk products in alpine regions of Switzerland

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Introduction

- Tick-borne encephalitis (TBE) cases have been on the rise in Switzerland, as in many other countries in Europe, for several years
- The viral infectious disease is usually transmitted to humans by tick bites
- Infection with the TBE-virus (TBEV) can also occur through the consumption of raw goat milk and raw goat milk products
- A risk assessment for the viral contamination of goat milk was performed for this area

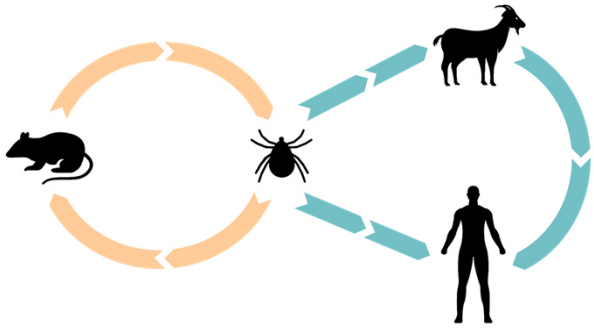

Figure: Infected goats can pass the virus through milk during a short viremic phase

Calculations and Results

- Calculations are based on the seroprevalence of antibodies against TBEV in goats in the Valais canton (Rieille et al. 2017)
- For risk calculation only household milk was considered as it is processed directly on the farm for home consumption

Probability range of a goat to be milked during the viremic phase

a = Assumed length of the viremic phase = **7d**
b = Numbers of periods in the field (based on the average age of sero-positive goats (= 3.4 years; 95% confidence interval [CL]: 2.8-4.1 years)) = **3-4**
c = Average duration of goat lactation = **240d**
d = Seroprevalence in the Valais canton = **4.25%**

$$\frac{a}{b \cdot c} \cdot d = \begin{cases} 0.031\% \; for \; b = 4 \\ 0.041\% \; for \; b = 3 \end{cases}$$

Probability range for household milk to be contaminated by TBEV

e = Share of household milk in total milk production = **3.9%**

$$e \cdot \begin{cases} 0.031\% \\ 0.041\% \end{cases} = \begin{cases} 0.0012\% \\ 0.0016\% \end{cases}$$

Worst-case scenario – all goats of an averaged sized herd undergo TBEV infection during 3-4 lactation periods: Probability of contaminated household milk

Average herd size (according to Rieille et al. 2017) = **14.9 animals**

$$14.9 \cdot \begin{cases} 0.0012\% \\ 0.0016\% \end{cases} = \begin{cases} 0.017\% \\ 0.024\% \end{cases}$$

Discussion

- The calculated probability of household milk contaminated by TBEV ranges from 0.0012% and 0.024%; this corresponds to approximately one out of 5000 milk samples
- This low probability fits with the reported case numbers of alimentary transmitted TBE in German-speaking countries over the last 10 years (2009–2018; 8/4422 cases)

Summary and Risk Minimization Measures

- TBE viruses can be transmitted from infected goats to humans through the consumption of raw milk and raw milk products
- The likelihood of milk contaminated by TBE viruses is very low, but increased cases of alimentary transmitted TBE have been observed in Europe recently
- TBE viruses can be inactivated by sufficient thermal treatment of raw milk
- TBE vaccination provides effective protection against the viral pathogen

Literature

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- Source tick picture: https://www.gardentech.com/insects/deer-ticks

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